

the stages of streams lower than those of the current month. All indications point to a considerable shortage of water by the middle of summer.

#### STUDIES IN FROST PROTECTION—EFFECT OF MIXING THE AIR.

By A. G. McAdie.

In the Monthly Weather Review for January, 1912, the writer calls attention to a marked illustration of temperature fluctuation at Kentfield, Cal., the base station of the Mount Tamalpais Observatory, during the frost period of December 11 to 14, 1911.

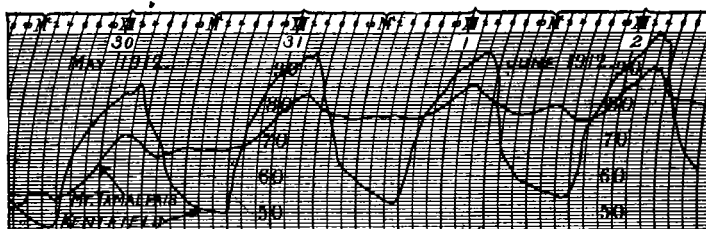
It was shown that as a result of thorough intermixing of the air strata there was a marked warming of the lower air at a time when under ordinary conditions and absence of circulation severe frosts would have occurred.

During the last two days of May, 1912, and the first two of June a warm spell occurred in California. Some of the temperatures were the highest recorded for nearly a year. This warm spell offered an interesting opportunity to compare temperature fluctuations at the two stations. The lower station, Kentfield, is 65 feet above sea level and 2,530 feet below the summit of the mountain.

It will be noted from the illustration that coincident with the passage of the sun west of the mountain crest, that is, about 4 p. m., the lower station is in shadow and the temperature falls for a period of 6 hours at an approximate rate of  $5^{\circ}$  per hour. It may be noted that this is a period of comparative stillness in the valley, except for light ascensional currents. It seems likely that the warm

air is displaced upward by a slow-moving stratum of surface air, which finds its way indirectly into the valley from the sea. This layer, however, is very thin, as is shown by the fact that the temperature rises abruptly after sunrise, and apparently there was little draining of the air down the mountain side.

It is interesting to compare the gains and losses of heat at the base station with that at the summit. There were approximately 600 hour degrees lost at the lower station during the night hours in excess of the amount lost during the same period at the upper station. During the hours



Comparative temperatures, Kentfield, Marin County, Cal., and Mount Tamalpais, from midnight May 30 to June 2, 1912, inclusive.

of bright sunlight the lower station shows an excess of approximately 500 hour degrees.

The comparison is interesting as showing that with proper ventilation and thorough mixing, the extreme temperatures experienced in the valley near the ground could have been avoided and a temperature record more like that experienced at the summit obtained.